What Drives Cost Adult Spinal Deformity Surgery?: Identifying Surgical Components with Highest Cost and their Effect on Patient Outcomes

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INTRODUCTION: Complexity of adult spinal deformity (ASD) surgery can carry a significant cost burden. With greater focus on value-based healthcare, it is necessary to study what high-cost components of surgery have greatest utility to patient outcomes.

METHODS: Operative ASD patients up to 2Y data included. Components: Percutaneous screws, PJK prophylaxis, BMP usage, approach (Anterior, Posterior), MIS techniques (ALIF/LLIF, TLIF, Circumferential), and number of rods used. Component cost was gathered by CMS.gov and published item rates, then totaled based on surgical technique. Utility data calculated by ODI to SF-6D using published methods. QALYs utilized a 3% discount for decline to life expectancy (78.7 years). Cohort ranked by component utilization and total cost: Low, Middle, and High. Multivariate regression used to assess the effect of high cost utilizer (HU) compared to low cost utilizer (LU) and components on 2 year outcomes.

RESULTS: 953 were included (60.5yrs, 76%F, BMI: 28.0kg/m2, CCI: 1.8). HU: 406; LU: 406. Average cost was $53,632 LU vs. $99,273 HU, p<.001. Within HU, greatest overall cost came from BMP ($53,023) with 64% (n= 259) having BMP (1% small, 4% medium, 59% large). BMP cost differs by kit: small - 4.2 mg ($21,800), medium – 8.4 mg ($23,667), large – 12 mg ($25,617). Mean cost was greater for BMP vs without (BMP $53,023 vs Non-BMP $41,145, p<.05), with no significant difference in utility ($80,337 BMP vs $85,718 non-BMP, p=.076), indicating preference for its use does not change surgical cost. Patients with PJK prophylaxis had higher cost of instrumentation at index surgery, but overall lower cost per QALY by 2 years ($59,600 Non-Prophylaxis vs $45,099 Prophylaxis, p<0.001). For approach, mean cost was lower for posterior ($1836.90 P vs $2367.75 A, p=.072). Percutaneous screws (mean cost $878) and rods ($258) had no significant difference in utility. Amongst MIS techniques, greatest cost utility was TLIF ($29,598.61 T vs $36,845.31 C vs $41,914.75 A, p<.05), despite highest cost for Circumferential ($29,640 C vs $25,568 A vs $21,311 T). Overall, HU were more radiographically deformed (SVA, PI-LL, PT; all p<.001). LU had significantly longer length of stay (LU: 8.7 vs HU: 6.1, p=.010), with lower odds of SICU (OR: 0.293 [0.091, 0.938], p=.039). However, HU had significantly lower EBL (1614mL vs. 2697mL, p=.027), lower delayed extubation (29.1% vs. 49.6%, p=.004). HU was 32.3% less likely to undergo reoperation within 90 days (OR: 0.677, [0.487, 0.942], p=.021). MVA found odds of MCID in SRS-22 Activity (OR: 1.663, [1.273, 2.173], p<.001) and SRS-22 pain(OR: 1.692, [1.231, 2.326], p=.001) was 1.7x higher for HU.

DISCUSSION AND CONCLUSION: This study found that patient utilizing highest cost components had superior outcomes compared to those without. Specific surgical components, such as BMP and PJK prophylaxis, improve postoperative risk and cost utility despite increase in total cost. These data suggest that higher cost surgeries can result in better clinical, radiographic, and patient reported outcome.